# More on Religion and Fertility: The French Connection

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## *"More on Religion and Fertility: The French Connection"*

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# More on Religion and Fertility: The French Connection

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**Abstract**

This paper contributes to the study of the relationship between religion and fertility. More specifically, I investigate the impact of being Catholic on fertility in France. Fertility is measured either by the number of children ever born or by completed fertility. I show that women who are strong practicers have significantly more children than other women; however, being a Catholic believer has no significant impact on fertility. I also construct two variables allowing me to detect that the particularized ideology mechanisms can partially explain why religion has an impact on fertility in my dataset. Nevertheless, I cannot exclude the social interactions hypothesis. The multivariate analysis I provide also validates the main mechanisms of the rational actor model.

Keywords: *Fertility, Religion, Particularized Ideology, Social Interactions, Education.*

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# 1 Introduction

Demographers have initiated a long tradition that consists of studying the relationship between religion and fertility. To do so, they have constructed a framework where alternative theories compete and complete each other. The present paper is a contribution to this literature and focuses on contemporary France. More precisely, it studies the impact of being Catholic on fertility measured either by the number of children ever born or by completed fertility.

Due to its limitation to France, this study is characterized by several specificities. First, despite its Catholic identity, France is very secularized (Hervieu-Leger (2004)) and it has been the first European countries to enter secularization. Lesthaeghe and Wilson (1986) argue that early secularization in France has been one major reason why the French fertility transition has been concomitant with the mortality transition.[1] It explains why the population did not explode during the demographic transition. Since 1945, the proportion of Catholics practicers keeps dramatically decreasing. This process quickened during the seventies. Hervieu-Leger (2004) estimates that, in 2001, the proportion of French who had at least one element of Catholic practice[2] per month is about 12%. Interestingly, despite this early and strong secularization, fertility in France is among the highest in Europe.[3] As shown in Figure 1, the total fertility rate in France has decreased from the beginning of the 20th century to the nineties; then it increased to almost reaching the replacement level.[4]

Second, until 2008, french laws made it very difficult to collect data on individual's religious affiliation. Then results about the relationship between religion and fertility are lacking for France. If religion had no impact on fertility, this specificity would not weaken the analysis of individual fertility behaviors but in line with the literature, this paper shows that this is not actually the case.

The data set "Enquête Mode de Vie des Français" contains data about religion and several

[1] Analyzing the decline of fertility in Europe and developing countries, Watkins (1987) more generally states that "*There is no reason to believe that institutional and ideational change cannot be as powerful solvents of traditional practices as economic change, or as rapid.*"

[2] Either going to church, going to cathechism, confession, etc. Frejka and Westoff (2008) provides an enlightening discussion about secularization in Europe.

[3] In 2009, the European average total fertility rate was 1,59 while the French total fertility rate was equal to 2 (data from Eurostat).

[4] In 1994, the French family policies became more generous. Subsidies for births particularly raised for families who decide to have a third child. Furthermore, strong efforts have been made to provide day nurseries and to reduce the cost of child care by sitters. Toulemon et al. (2008) argue that these family policies have created especially positive attitudes towards two or three child families. Such policies have largely enjoyed a consensus among politicians and French residents. Laroque and Salanié (2005) also find that financial incentives have been efficient in increasing the fertility in France.

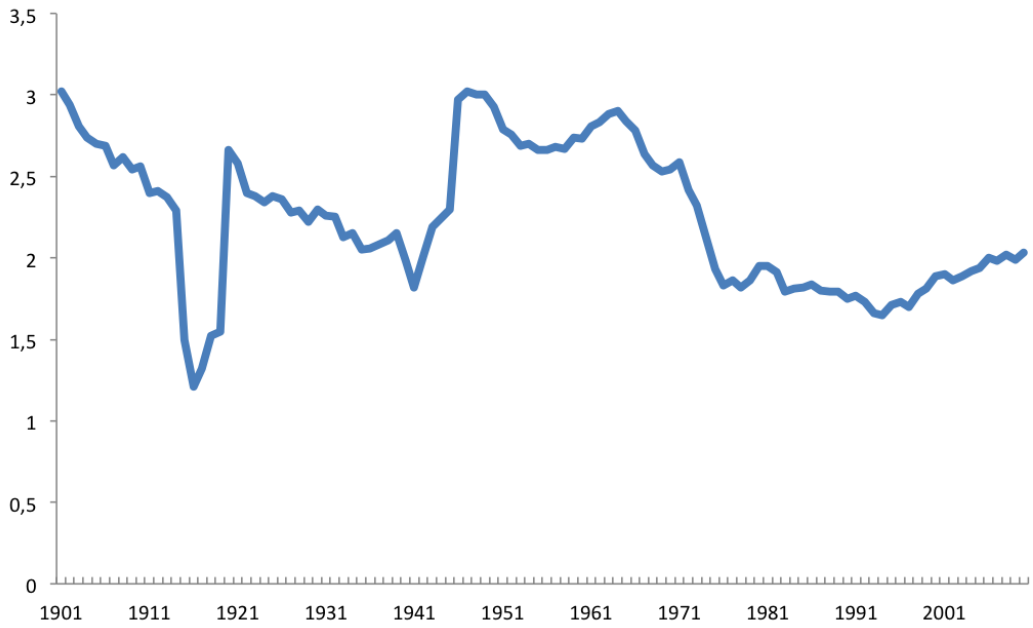


Figure 1: French Total Fertility Rate during the 20th century - Data from Institut National de la Statistique et des Etudes Economiques.

dimensions of the religiousness of the respondents as well as complete informations about her economic situation (incomes, savings, wealth, history on the labor market, etc.), her lifestyle (health, addictions, consuming habits, etc.), her risk aversion and her values (religion, politics, attitude toward foreigners, etc.). It allows me to test a large set of theories and to implement several robustness tests.

In the present study, I especially quantify the impact of religion and of religiousness on the number of children ever born (CEB). The sample I use suffers from a selection bias: it under-represents non catholic religions.[5] For this reason, I only compare the fertility of catholics to the fertility of people who declared having no religious affiliation (in the sense that they have not been raised in a religious family). Several dimensions of "being Catholic" are investigated. I explore the impact of having been raised in a Catholic family, of believing (to be a Catholic believer or not) and of religiousness on fertility. Religiousness will be measured either by attendance to religious offices or by self estimation of the importance of religion in daily life.

Summary statistics in Table 1 indicate that in my sub-sample, women who have been raised in a Catholic family have more children than Non Catholics and this fertility differential

[5]Among women without missing informations in the dataset, there are 82,1% of Catholics, 2% of Protestants, 0,16% of Orthodox Christians, 0,66% of Jewish, 0,44% of Muslims and 14% of non religious persons. For instance, the estimated proportion of Muslims in France lies around 5% in 2008 (data from INED).

| **Variables** | Sample | All Catholics | Practicers | Non Catholics |
|---|---|---|---|---|
| Proportion in % | 100 | 82,5 | 30,04 | 17,5 |
| Mean number of CEB | 1,58 | 1,62 | 1.84 | 1,36 |
| % with primary education | 8 | 8,9 | 11,8 | 3,6 |
| % Higher Education | 37,8 | 37 | 34,8 | 42,5 |
| % never married | 18,1 | 17 | 13,3 | 24,7 |
| % more than 45 yo | 52,3 | 56 | 67 | 31,6 |
| % more than 28 yo | 10,46 | 9,14 | 6,2 | 18,6 |

Table 1: **Summary statistics for the sub-sample used in the regressions**

is even stronger between Catholic Practicers[6] and non Catholics. In this paper, I first try to determine if this fertility differential is due either to the fact that Catholicism implies higher fertility or to the fact that Catholics are characterized by living conditions that make them having more children than others. In other words, is there any causality between Catholicism and high fertility rates? Interestingly, Catholics have lower education levels than non Catholics and, once again, this differential is stronger between non-Catholics and Catholic Practicers. Furthermore, a much lower proportion of Catholics never married what can also imply higher fertility rates than non-Catholics. Finally, Catholics - and especially Practicers - are much older than non-Catholics what can explain their lower education levels, their higher marriage rates as well as their higher fertility (they have more often achieved their reproductive process).

The main advantage of using multivariate econometrical methods lies in the possibility to measure the impact of being a Catholic controlling for all the differences I have mentioned above. Doing so, I find that having been raised in a Catholic family has no effect on fertility while defining oneself as a religious believer has, *a priori*, a positive and significant impact on individual fertility. Nevertheless this latter effect loses its significance when the degree of religiousness is introduced. Religiosity is finally the only religious variable that really matters for fertility. This result is validated whether religiosity is measured by church attendance or by the respondent's subjective evaluation of the importance of religion in daily life.

This result is in line, for instance, with Heineck (2006) who studies the link between religion and fertility in Austria. He finds that women who are "strong Catholic believers" are expected to have larger families than woman without any religious belief. Hacker (1999)

[6]For summary statistics, a person is considered as a practicer if she assists to offices many times in the year in addition to religious holidays and religious celebrations like marriage and baptism. A richer definition will be used in the regressions.

shows that the degree of Christian conservatism is a good proxy for religious sentiment for American-born white women in the nineteenth century. Conservatism is measured by a dummy variable indicating whether individuals belong to specific religious groups such as Congregationalists, Universalists, Lutherans or Catholics. He finds that this proxy has a significant effect on women's fertility: more conservatism implies a higher total fertility rate. Williams and Zimmer (1990), Adserá (2006) as well as Amin et al. (1997) show that religiousness measured by church attendance has a positive and significant impact on fertility.[7]

One major limitation of my dataset lies in the fact that I measure the relationship between *current religiosity* and fertility instead of the relationship between religiosity before births and fertility . Indeed, studies like Stolzenberg et al. (1995) and McCullough et al. (2005) show that having a child has a significant impact on parent's religiosity in the US. Then, measuring the impact of current religiosity on fertility entails a problem of causality: I do not know if correlations quantify the impact of past religiosity on fertility or the impact of motherhood on current faith. Nevertheless, Berghammer (2012) shows that there is no double causality for an European country like Netherlands. One main reason for that result is that, contrary to the US, in Netherlands, Parishes do not have strong welfare functions. Then, after a birth, a woman has no financial incentive (benefit) to increase her proximity and interactions with Catholic churches. From this point of view, France is very close to Netherlands. In France, laws enforce a strict segregation between religion and public institutions and the welfare state is very prominent (see for instance Mayeur (2005)). This does not mean that religious organizations are not a source of welfare and socialization but there are very minor compared to public and non-religious institutions. So despite our dataset cannot statistically exclude a double causality, its importance is probably weak.

The rest of the paper is organized as follows. In section 2, I discuss the theoretical contribution of the present study. Then, in section 3, I expose my strategy of estimation and in section 4, I discuss my results. Section 5 displays some robustness checks and section 6 concludes.

# 2 Theoretical contribution

Following McQuillan (2004) and Zhang (2008), four main theories compete to explain the impact of religion on fertility: (*i*) the characteristic hypothesis, (*ii*) the particularized ideology

[7]Note that Brañas-Garza and Neuman (2007) find that, among Spanish catholics, the exposure to religious practice during childhood has a positive impact on fertility. They also find that current religiosity of the respondent has no effect on fertility. However, the exposure to religious practice during childhood and current religiosity are strongly correlated.

hypothesis, (*iii*) the minority status hypothesis and (*iv*) the socialization hypothesis.[8] The characteristic hypothesis mainly conjectures that once all the individual characteristics have been taken into account, religion should not have any impact on fertility. Despite Brañas-Garza and Neuman (2007) find no time persistent differences in fertility rates between the main monotheistic religions, this theory is not verified in many studies that takes religiosity into account (as mentioned above, see Adserá (2006) and others). In this paper, I also show that despite I take into account a large set of individual characteristics, practicing Catholics have more children than others (non practicing catholics and non religious). In my main estimation, I evaluate that, *ceteris paribus*, a woman who practices Catholicism intensively (goes to the office at least once a week) has 24% more children than a woman who never goes to the office. The minority status hypothesis can also be easily rejected to explain why practicing catholics have more children than others in France. Indeed, Catholics are far from being acculturated in France and high fertility norms have been evidenced among practicing Catholics (see for instance Lesthaeghe (1977)).

The particularized ideology hypothesis states that religions are characterized by specific views about fertility, it induces a fertility differential between these groups as well as between specific religious group and non religious persons. Among others, Lesthaeghe and Wilson (1986) show that, during the Industrial Revolution, European Catholics have been characterized by the adherence to high fertility norms and family oriented values. The persistence of this ideology in France is underlined, for instance, by Prioux and Régnier-Loilier (2008). The socialization hypothesis argues that religious institutions play a major role in determining individual fertility as through the interactions taking place, each member's decision or lifestyle shapes the behavior of other members.[9] Disentangling these two effects is difficult as the conclusions of these two theories are not incompatible. Nevertheless, I construct two variables which indicates that the particularized ideology plays a role but which cannot exclude the socialization hypothesis.

The first variable I construct is denominated "Family Values".[10] Family values are measured by replies to the following questions: "Which of the following values do you (or would you) try to transmit to your children?" and "Among the same set of values, which ones did your parents transmit to you?" Respondents have been allowed to choose three answers among twelve like "Independency", "Taste for Work", "Generosity", Happiness", Honesty", "Family

[8] In Zhang (2008), this last hypothesis is called the "social interaction hypothesis". Mosher et al. (1992) shows that none of these hypothesis can fully explain the fertility differential between Catholics and Protestants in the United States.

[9] In economics, papers by Bisin and Verdier (2001) developed a theoretical model of cultural transmission that is, at least in part, compatible with this framework.

[10] From French "Le sens de la Famille".

Values", etc. A respondent who chooses "Family Values" for one of the questions gets one, she gets two if she chooses it for the two questions and zero otherwise.[11] The second variable I introduce measures the number of brothers and sisters of the respondent.

I find that both the score variable "Family Values" and parental fertility have a positive and significant impact on the respondent's fertility: having been raised in a large family where family values were important significantly increases the respondent's fertility. Including these two variables in the regression does not imply that being a Catholic practicer has no more impact on fertility, *however* its effect is smaller and even less significant. How to interpret this result?

I argue that the positive impact of both the adherence to family values and of having been raised in a large family goes in favor of the particularized ideology hypothesis. Indeed, among others, Lesthaeghe (1977) shows that, in Western Europe during the Industrial Revolution and subsequently, the Catholic Church promoted family values among which having large families was very important. Furthermore, having been raised in a large family instils, at least partially, high fertility norms to children. When these two variables are included in the regressions, a part of the reasons why being a practicer increases fertility is explained and the impact of being a practicer is smaller. Nevertheless, even when these two variables are included, being a Catholic practicer still has a positive and significant impact on fertility. Why is it the case? Two phenomena are at play. First, the two variables that I have constructed allows to detect that the particularized ideology has an impact but they are imperfect and do not allow to fully control for it. Furthermore, we can suspect that the alternative mechanism is also at play such that socialization processes have an impact on fertility in my sample.[12]

Interestingly, the results I find are also in line with the rational actor model described by Pollack and Watkins and developed jointly by economists and demographers. This model argues that given the preferences of agents, their behaviors can be explained by their individual characteristics shaping the costs and benefits to have children and how many. The economic

[11] Alesina and Giuliano (2007) find that strong family ties are associated with higher fertility with a different method. They measure family ties with individual responses from the World Value Survey "*regarding the role of the family and the love and respect that children need to have for their parents*" for over 70 countries. They show that strong family ties implies a relatively stronger reliance to home production than to labor market participation. It results in lower labor force participation of women and higher fertility.

[12] Notice that, an alternative interpretation could present the positive impact of parental fertility as favorable to the social interaction hypothesis. Indeed, following the framework of Bisin and Verdier (2001), family is the first social institution transmitting norms and values a child is exposed to. In other words, Catholic parents are also members of the Catholic institution children have contact with. Then an imitation process can arise. Parental fertility could also measure alternative transmissions from parents to children like social position and location. Nevertheless, this variable allows to control my results for these effects.

analysis of fertility behaviors enriched with microeconomic foundations since the seminal approach of Becker and his co-authors (1960, 1973, 1976). The Beckerian theory assumes that children are time consuming, especially for women. It implies that higher female income results in smaller fertility rates.[13] The household theory of fertility shows that an increase in the income of women reduces their fertility while an increase in male income increases the household's fertility.[14] These standard mechanisms of endogenous fertility models have largely been evidenced by empirical studies without including cultural variables.[15]

Pollack and Watkins show very clearly that this model is compatible with the notions of culture and diffusion, at least in part.[16] The present paper can also be considered as part of a large economic literature that tries to validate the rational actor model where culture is a dynamic determinant of rational behaviors (see Guiso et al. (2006) for a review of literature). In this literature, religion is often chosen to approximate culture but as any approximation, it is incomplete and disputable.[17]

# 3 Strategy of estimation

## 3.1 Data and variables

The dataset consists of 3826 French individuals aged between 18 and 93. The population is divided between 2080 women and 1746 men. In the main regressions, only women are considered. After having deleted missing observations, the sub sample reduces to 1793 observations.

In the main regressions, I study the impact of religion on the number of children ever born (CEB) and not on completed fertility of women. This allows the sample size to be larger

[13]Becker and Tomes (1976) argue that an increase in the parental income incites parents to have less children better educated because the income elasticity of demand for quality is higher than the income elasticity of demand for quantity.

[14]See, for instance, Browning et al. (2006) for a review of this literature.

[15]See Hotz et al. (1993) for a review of this literature. The absence of cultural determinants was essentially due to two phenomena: (*i*) the lack of datasets allowing to clearly identify and measure cultural variables and (*ii*) the Becker & Stigler's critique stating that: "*explaining the evolution of behaviors by changes in tastes provides endless degrees of freedom*" (1977, p. 89).

[16]A version of this model has been nicely developed in a formal and general way by Bisin and Verdier (2001) and applied to the fertility transition in Western Europe by Baudin (2010). These contributions can be understood as attempts to formalize the Easterlin's Synthesis model of fertility (see Easterlin et al. (1980)) that is also compatible with the rational actor model where culture is endogenous.

[17]A noticeable exception lies in Fernandez and Fogli (2007) who show, without using religious variables, that culture is important to the understanding of female work and fertility decisions.

and to extend the study to a higher number of generations. If religion has not the same impact on all generations of women, restraining the analysis to older woman could lead to biased estimations. However, during robustness checks, the sub sample of women who have achieved their fertility is studied. Results will be close to these I get with CEB.

As not all women in the sample have completed their fertility, their age has a strong influence on her fertility. The older a woman, the higher her fertility. This partly comes from the postponement of the first birth. Furthermore, women older than 45 are expected to have completed their reproduction process.

Directly introducing the age of the respondent sensibly increases the overall fit of the model. The effect of age reflects, however, much more complex phenomena than the simple position of the respondent in her "reproductive process". Indeed, age also reflects important cohort effects. During the second half of the twentieth century, France has experienced, among other major transformations, a generalization of education, at least one profound modification in family policies (1994), a strong decrease in the influence of Catholicism, a liberalization of the marriage market and a diversification of the forms of unions. The standard deviation of age is about 16 years. A difference of 16 years between two women can explain their differences in fertility because they are not in the same position in their reproductive process but also because they have experienced differences in the quality of the education system, in family policies, in the prevalence of religious norms in the whole society, etc.

Only the position in the reproductive process is used in the regressions: I control my results by introducing a variable "less than 28 years old" and "more than 45 years old".[18] This is called the dummies strategy. It makes the interpretation of the effect of age easier. Notice that these dummies also capture cohort effects but these latter will be easier to identify.[19]

When measuring the impact of religion, it is important to discriminate between the adherence to a specific religion and religiousness. Here, religious affiliation refers to the response to the question: "In which religion have you been raised?". As mentioned in the introduction, the dataset suffers a selection bias that under-represents Muslims, Protestants as well as Jews. Then I restrict my study to Catholics and people who have not been educated in a religious family.[20] Faith is measured by the response to the question: "Are you a believer?".

[18]By assumption, a woman can be in one of the following situation: not fertile (less than 16 years old, not useful here), fertile but younger than the average age at first birth (28 for France in 2006), fertile and older than the average age at first birth and in the "completed fertility position" (older than 45 by assumption).

[19]In table 8 of the appendix, results are also provided in a case where the age is directly introduced in the regressions. Impacts of religiosity, parental fertility and transmission of Family Values are still positive and significant.

[20]The variable "Religious Family of Origin" takes value 1 if the respondent has been raised in a religious family.

As in Williams and Zimmer (1990), Adserá (2006) and Amin et al. (1997), the degree of religiousness is first measured by attendance to religious office. The variable "Office Frequency" goes from one to five. It equals to one if the respondent announces never going to religious office and five if she goes to office at least once a week. It increases with the attendance to offices. For robustness checks, another measure of religiousness is provided: people were asked to evaluate the importance of religion in their own life from zero to ten. This measure is discussed in section 5.

Women of the sub-sample are not necessarily married because, once again, reducing the analysis to married women would induce the existence of a selection bias.[21] It can reasonably be expected that married woman are not characterized by the same sensitivity toward religion and familial values than non married women. I obviously control my results for the respondent's situation on the marriage market.

The rational actor model argues that female's education and income play a major role in the determination of optimal fertility. Two dummies are provided to control if the respondent has only a primary education level or an university level. Two variables are needed to measure income: female income and male income. The dataset contains informations about respondent's annual net income and household's total income. Then income of male can easily be inferred.[22] Notice that an endogeneity bias can be suspected. Indeed, fertility and income can have common determinants which are not taken into account in the present paper. For example, one can expect that subsidies for day nurseries increase both fertility and incomes (higher labor force participation). This problem has been investigated to validate the robustness of my results (see sub-section 5.2).

Fertility at the micro level consists of a count variable. Long and Fresse (2006) underline that count data have to be analyzed with Poisson regressions or Negative Binomial regressions in order to avoid any doubt of inconsistency and inefficiency. Individual data on fertility structurally exhibit a zero inflated distribution. This characteristic comes from both the postponement of first birth in developed countries and the increase of childlessness since the second World War (see Rowland (2007)). In France, the average age at first birth was very close to 28 in 2006.

Several robustness checks are implemented. Their goal is to verify that the impact of religion and proxies for cultural transmission on fertility are not spurious. To do so, I first investigate

[21] This choice is also made, for instance, by Miranda (2008) and Mosher et al. (1992).

[22] Notice that, as in Fernandez and Fogli (2007), Melkersson and Rooth (2000), Miranda (2008), etc., reported incomes are current incomes whereas endogenous fertility models deal with life cycle income. As in these contributions, my results are controlled by education and age of the respondent in order to limit this weakness.

alternative distribution as well as the problem of over dispersion. Then, I address endogeneity of female income and I provide an alternative measure of religiousness. Furthermore, two alternative samples are studied. The first sample only includes women older than 45 in order to measure the impact of religion on completed fertility. The second sample includes men. It allows to suppress any doubts about the effect of sample selection on the relation between religion and fertility.[23] All robustness checks indicate that religion and transmission of values inside the family are relevant to explain fertility in France and that the ZIP regression is the best model to describe fertility choices in the present framework.

## 3.2 Description of the regression model

The assumption that fertility is distributed following a Poisson distribution results in the following probability of having $y_i = n$ children:

$$\Pr\left[y_i = n \mid x_i\right] = \frac{e^{-\mu_i}\mu_i^n}{n!}$$

where $\mu_i = \exp\left(x_i\beta\right)$ with $x_i$ the individual characteristics. However, individual fertility data often exhibit an excess of zero observations. So in order to take into account the high number of zero in the data set, a Zero Inflated Poisson (ZIP) regression model is proposed.[24] This method allows to explain both the number of children born (with a Poisson model) and the decision not to have children (with a Logit model).

The probability ($\eta_i$) for an individual to belong to the group exhibiting a zero count ($G^0$) is represented by a Logit model:

$$\eta_i = \frac{e^{\delta_i z_i}}{1 + e^{\delta_i z_i}}$$

where $z_i$ are the variables explaining the decision to have children and $\delta_i$ the estimated parameters. If an individual belongs to the zero group ($G^0 = 1$), her estimated fertility is always zero. If she does not belong to the zero group ($G^0 = 0$, with probability $1 - \eta_i$), her fertility is assumed to be distributed following a Poisson distribution. Then, her probability to have $n \geq 0$ children equals $\Pr\left[y_i = n \mid x_i\right] = \frac{e^{-\mu_i}\mu_i^n}{n!}$. Finally, the assumed distribution for count fertility is sensibly different from the Poisson regression model. Indeed, the overall

[23] To check robustness for assumptions on the distribution, I run an ordered probit regression as in Fernandez and Fogli (2007), as well as an ordinary least square regression. See robustness checks.

[24] Long & Freese [2006] provide a very simple and enlightening presentation of the method to obtain the zero inflated Poisson regression model.

probability for a zero count is:

$$\Pr\left[y_i = 0 \mid x_i,\ z_i\right] = \eta_i + (1 - \eta_i)\Pr[y_i = 0 \mid x_i, G^0 = 1]$$

And the probability for a positive count is:

$$\Pr\left[y_i = n > 0 \mid x_i,\ z_i\right] = (1 - \eta_i)\Pr[y_i = n > 0 \mid x_i, G^0 = 0]$$

Obviously, this modified Poisson distribution increases the probability to have a zero count compared to a standard Poisson regression model. As the Poisson regression model and the zero inflated regression model are not nested, to determine if the distribution really exhibits an excess of zeros, a Vuong test [1989] is run. It makes clear that the ZIP regression model should be preferred to a simple Poisson regression model. During robustness checks in section 5, I also show that the ZIP model is preferred to a zero inflated negative binomial regression model and to an ordered probit regression model.

# 4 Results

In a first subsection, I show that religiosity is an important determinant of fertility in a context where the main mechanisms of the rational actor model are controlled for. In this specific context, being a practicing catholic has a positive impact on the number of children ever born. In a second sub-section, I show that a part of the influence of religiosity comes from the adherence to family oriented values and from the impact of the fertility of respondent's parents. Even if they seem to be weak candidates to understand why religiosity has an impact on fertility, they are significant.

## 4.1 Impact of religion and of economic characteristics

In order to clearly determine the impact of religion and cultural transmission, a step by step ZIP regression model is implemented (see Table 2). In a first regression (Model 1), neither religious nor cultural variables are considered. In a second regression (Model 2), the variables describing the cultural transmission from parents to children are introduced. These variables describe the parental fertility of the respondent and the transmission of family oriented values inside the family. In Model 3, I introduce the variable "Religious

Family of Origin" describing if the respondent has been raised in a Catholic family. In Model 4, the variable "Believer" is added. It equals one if the individual answers "Yes" to the question: "Are you a Believer?" In model 5, I add "Office Frequency" which measures respondent's religiousness.

In the present sample, the high number of zero counts is explained by the respondent's age, the size of her town and her "higher education status". The older a woman is, the lower her probability to be childless . Furthermore, a woman who has engaged in higher education and does not live in a small town has a higher probability to choose not having children.[25] The excess of zero is then explained by both the strong postponement of first birth in developed economies (women tend to have their children after 28) and the fact that urban highly educated women more often choose not having children than other woman.

Alternative regressions for the excess of zero have been tested (see Table 4 in appendix). I find that never having been married has no impact on the decision to be childless. It confirms that limiting the study to married woman could introduce a selection bias. Religiousness and primary education have no significant impact on the probability to be childless.

As shown in Model 2, to have been raised in larger families significantly increases respondent's fertility. Furthermore, the transmission of family oriented values among generations also increases fertility.

Another major result lies in the fact that having been raised in a Catholic family and proclaiming to be a religious believer do not significantly increase the number of children ever born (see Table 2). Indeed, in model 4, the variable Believer was, a priori, significant because, putting alone, it brings out two dimensions of the religious background: believing and practicing (religiousness). This is confirmed when religiosity is added in the regressions (see model 5). Finally, religiousness measured by the frequency of attendance to offices is the only religious variable which significantly influences fertility.

The introduction of religious variables does not weaken the impact of proxies for the transmission of fertility patterns and family oriented values inside the family while, as shown in the next subsection, the reverse is not true.

The Bayesian Information Criterion (BIC) indicates that Model 6 is very strongly preferred to Model 5. It confirms that both having been raised in a specific religion and being a believer are meaningless to explain fertility behaviors. Following Raftery (1996), the BIC indicates a positive evidence in favor of Model 6 against Model 1 but not a strong evidence.

[25] Baudin et al. (2012) propose a theoretical model of childlessness compatible with this finding.

As Model 1 and 6 are nested, a Likelihood Ratio (LR) test can be run. It appears that Model 6 should be strongly preferred to Model 1.[26]

Usual predictions of the rational actor model are also validated. Income of men and women have opposite effects. Female income has a negative impact on her fertility while the income of the man has a positive impact. This tends to confirm that opportunity costs of fertility are essentially determined by the female's income. This interpretation is conditional on the assumption that mothers have to invest a higher part of their time in child rearing than fathers. In line with the results of Ahn and Mira (2002), this effect is expected to be smaller in France than in some other European countries like Germany, Greece and Italy. Indeed, public infrastructures and fiscal schemes in France allow women to conciliate high rates of participation to the labor market and high fertility.

School attainment has a significant impact on the number of CEB only for less educated women. Indeed, the number of CEB of a woman who has only achieved at least primary education is 19,1% higher than a woman who has achieved a high school graduation. Women with an university level have a stronger probability to be childless but, when they decide having children, their fertility is not significantly different from women who only have a high school diploma.

Finally, women younger than 28 exhibit a lower fertility than others. Indeed, in 2006, the average age of entry in fertility for French woman was 28. Furthermore, women older than 45 are expected to have achieved their reproduction process. In consequence, they mechanically tend to have more children than women who have not yet achieved their reproductive process. Notice that, as mentioned in the preceding section, this effects are also suspected to derive from some cohort effects. Particularly, the generous family policies implemented in France since 1994 have sensibly increased fertility. This could have altered the impact of the variable "More Than 45 yo" because the group of women being older than 45 embodies the group of women who achieved their reproductive process without enjoying generous subsidies for fertility. However, the effects of the position in the reproductive process are in adequacy with intuition, it then indicates that the cohort effects are not too strong.

## 4.2 Particularized ideology and socialization hypothesis

As mentioned in the introduction, the impact of religion and religiosity on fertility can be due to the adherence to specific values or to socialization. I propose here to run three

[26]The null-hypothesis is that the coefficient of Office Frequency, Parental Fertility and family Values are all equal to zero. The probability to prefer model 6 against model 1 while model 1 fits better the distribution than model 6 equals to 0,0002.

regressions to detect these two channels.[27] As shown in the first regression of table 3, I include religiosity but I do not include either fertility of the respondent's parents or adherence to family oriented values. This model indicates that an increase of one standard deviation in the Office Frequency increases the estimated fertility of the respondent by a factor of 1.044. In other word, the estimated fertility of a woman with the maximal religiousness is 24% higher than the estimated fertility of a woman without any religiousness.

In the second regression, I add the fertility of the parents of the respondent. I then obtain a parameter equal to 0.0334 meaning that the fertility differential becomes 21,8%. This result means that a part of the fertility differential between highly religious persons and non religious persons comes from the fact that highly religious persons have been raised in large families and reproduce in part this scheme in their own life.

In the third regression, I replace the fertility of the respondent's parent by the variable Family Values. I obtain a parameter equal to 0,0316 and a fertility differential of 20,5% between highly religious persons and non religious persons. It appears that compared to the first regression, the impact of religiosity is significantly smaller; furthermore the variable office frequency even looses a part of its significance. This goes in favor of the particularized ideology as including the transmission of family values from parents to children explains in part why religiosity as a positive and significant impact on the number of children ever born. It seems that Family Values is a better detector of the particularized ideology hypothesis than the fertility of the parents of the respondents; nevertheless these two detectors are significant.

Obviously, this way to control for the particularized ideology hypothesis remains weak but for the best of my knowledge, this is the only way to show that this mechanism is at play in my dataset; keeping in mind that socialization has not been explicitly detected and could also play a role.

# 5 Robustness Checks

The following subsections test the robustness of my results.

[27] In these regressions, I exclude the variable higher education from the poisson part of the regression as it was not significant in the main regressions. Obviously, excluding an even non significant variable makes other coefficients change at the very margin.

## 5.1 Overdispersion and Alternative distributions

This subsection provides robustness checks for the distribution. The estimation of count data with a Poisson or Zero Inflated Poisson regression model can be subject to overdispersion. Looking at the summary values, it appears that the sample's variance (1,762) is greater than its mean (1,582). To test for overdispersion, a zero inflated Negative Binomial regression model is provided.[28] The negative binomial regression model allows the variance of the distribution to be greater than its mean: $V(y \mid x_i) = \alpha E(y \mid x_i)$. An LR test for the assumption $\alpha = 0$ is proposed. The probability of rejecting $\alpha = 0$ when this is true equals to 0,938. As the data set is not subjected to overdispersion, the zero inflated Poisson regression model should be preferred.[29]

Fernandez & Fogli [2007] analyze fertility data at the micro level using ordered probit regressions. I also use this method to test the impact of cultural background on fertility in addition to Ordinary Least Squared (OLS) regressions.[30] The ordered probit regression model (Table 5) also indicates that having been raised in a religious family and being a believer have no impact on fertility. LR test for nested model and differences in BIC indicate that the model which includes the religiousness variable (office frequency), the parental fertility and the Family Value variable is preferred to the two other ordered probit models. Expected differential fertility between woman with the maximal religiousness and women without religiousness is about 20%.

In Table 5, OLS regressions also conclude that the model which excludes the variables No Religion and Believer should be preferred to other OLS models. The OLS regressions provide results which are closed to the zero inflated Poisson regression model and the ordered probit model.

These regressions confirm that the significance of the relation between religion, cultural transmission and fertility, is not dependent on my assumption on the distribution.

[28] In case of overdispersion, the standard errors in the PRM will be biased downward, resulting in spuriously large z-values and spuriously small p-values (Cameron and Trivedi (1986)).

[29] Because $\alpha = 0$ with a very strong p-value, regressions are not reported. Indeed, values of estimated parameters are indentical in the two regressions. Their only differences lie in the z-statistic for the inflation term which are smaller in the zero inflated negative binomial regression model than in the zero inflated poisson regression model. Nevertheless, significance of each variable remains unchanged.

[30] Long & Freese [2006] underline that count data can sometimes be analyzed with OLS regression.

## 5.2 Endogeneity Bias and Instruments for Female Income

The Beckerian models of fertility show that fertility and income have common determinants like the cost of the quantity of children which determines both the female fertility and her participation to the labor market. If the female income is endogenous, it would be correlated with errors and result in some inconsistency. In this subsection, I propose to investigate this question in the framework of OLS models. As previously shown, OLS regressions provide satisfying results in comparison to zero inflated poisson and probit models. Dealing with OLS allows to apply simple methods to address endogeneity.

I first perform a Durbin-Hausman-Wu test of endogeneity for the female income which shows that the female income is endogenous.[31] Indeed, the Durbin-Hausman-Wu statistics indicate that the probability to accept exogeneity of the female income while it is endogenous in reality, equals 37,6%. Following this result, I propose to instrument the women's income by the variables "Financial Expert" and "Bank Loan".[32]

The variable "Financial Expert" comes from the answer to the following question: "When you have to make a financial investment, do you consult a Financial Expert?" Respondents has the choice between three answers: "Often", "Sometimes" or "Never".[33] One can reasonably expect that the answer to this question is negatively correlated with income because it is relied on the frequency and amounts of savings but not with fertility. Indeed, consulting financial expert tells nothing about the risk aversion of the respondent. So it is not suspected to be related to prudency or risk taking which could be, however, related to fertility.

The variable "Bank Loan" comes from the response to the following question: "If you needed money, do you expect that you could borrow it to a bank?" As for "Financial Expertise", the *expectation about bank loan* is suspected to be correlated with income but not with the fertility choice.[34]

As expected, the variables "Financial Expert" and "Bank Loan" both have a negative and significant impact on income (see "female income regression" in Table 6). Furthermore, after its instrumentation, female income still has a significant negative impact on expected fertility

[31] This test was first proposed by Durbin (1954) and separately by Wu (1973) and Hausman (1978).

[32] I choose to use two instruments rather than only one because it allows to run Sargan and Difference in Sargan tests for the exogeneity of instruments. Indeed, the Difference in Sargan test (Hansen Sargan test) is a test of overidentifying restrictions (see Wooldridge (2000)).

[33] The variable "Financial Expert" equals one if the respondent chooses "Often", to two if she chooses "Sometimes" and to three if "Never". Then "Financial Expert" is expected to be negatively correlated to income.

[34] The variable "Bank Loan" equals one if the answer is "No" and zero if "Yes". Then "Bank Loan" is expected to be negatively correlated to the respondent's income.

while male income has a positive one. Notice that coefficients of "Primary Education" and "Parental Fertility" and "Office Frequency" still have the same sign but are now smaller. Furthermore "Office Frequency" is now significant at the 5% confidence level and "Primary Education" and "Parental Fertility" at the 10% one. I provide Sargan and Difference in Sargan statistics to test the exogeneity of my instruments. These tests conclude that these latters are satisfying at the 5% confidence level (see Table 6).

Finally, in the OLS framework, there exists an endogeneity bias for female income. After a correction for this bias, the effects I determined in the previous section remain robust.[35]

## 5.3 An alternative Measure of Religiousness

The data set provides an alternative measure for religiousness. It consists in the answer to the question "Between 0 and 10, how do you evaluate the importance of religion in your own life?" This variable is subject to some caveats. First, religion can be important in the life of a believer because he or she is very religious but, alternatively, religion can be important in the life of a non believer if his/her family or neighborhood is composed of practicers. In other words, the importance of religion in the life of a person can reflect something else than his/her religiousness.

Furthermore, this measure consists of a subjective appreciation while frequency of church attendance is an objective criterion. Two respondents can have the same religious behavior but different subjective estimates of the importance of religion. "Marking" makes interpretations harder because differences in evaluations are less objective than differences in church attendance. To weaken this limitation, a variable "Estimated Religiousness" is constructed. It equals: $(i)$ 1 if the respondent's answer belongs to [0,3], $(ii)$ 2 if her answer belongs to [4,6] and $(iii)$ 3 if it belongs to [7,10].

The variable "Office Frequency" has been replaced by the variable "Estimated Religiousness" in the zero inflated Poisson regression model and also in an ordered probit regression model (see Table 7 in appendix). In the zero inflated Poisson regression model, "Estimated Religiousness" has a significant positive impact on fertility when the variables "Catholic" and "Believer" are not taken into account. An LR test between the model with "Estimated Religiousness" and without it, indicates that the first model is preferred at the 5 percent level. The differences in BIC are not conclusive. The estimated differential fertility between an agent who strongly cares about religion (Estimated Religiousness = 3) and an agent who

[35] Ideally, this method should be applied to the poisson regression model. However, it is confronted to a problem of convergence of the estimators.

does not care about religion (Estimated Religiousness = 1) equals to 10,2%. The same kind of results are found with the ordered probit regressions where BIC differences indicates a strong preferences for the model which includes religiousness. Notice that, once again, the impact of the transmission of values into the family, is robust to the introduction of religious variables.

Studying the impact of religion with the variable "Estimated Religiousness" is less conclusive than with Church attendance. This is probably due to the inherent imperfections of this measure. However, whatever the chosen measure and the estimation strategy, having a strong religiousness always increases fertility, at least at the 5 percent confidence level.

Interestingly, this result is opposite to these of Frejka and Westoff (2008). In a multivariate analysis, they who find, for Europe as a whole, that religiousness measured by church attendance has no significant impact on fertility while importance of religion in daily life is significant. One possible reason for that different result can be that, when analyzing the impact of religiosity on fertility, France is closer to Southern European countries than to the rest of European countries. Indeed, for Southern European countries, Frejka and Westoff (2008) finds that church attendance remains a significant determinant of fertility. It is also important to notice that the regression model used in their article is different from a ZIP model.

## 5.4 Alternative Samples

### 5.4.1 Completed fertility

As mentioned in section 4, all women of the sample have not yet achieved their reproductive process at the time of the study. I then study the number of children ever born instead of completed fertility. Model 5 of Table 2 has been run on the subsample of women who achieved their reproductive process.[36] Intuitively, the distribution is less suspected to exhibit an excess of zero observations since this was greatly explained by the age of the respondent. Indeed, a Vuong test indicates that the Poisson regression model is preferred to the ZIP regression model.[37] An ordered Probit regression model is also provided (see Table 5 in appendix).

[36]It reduces the sample's size to only 943 observations. The reduction of the sample to women who have completed their fertility has been used, among others, by Melkersson and Rooth (2000) and Covas and Santos Silva (2000).

[37]The Vuong Statistic equals 0.83.

In both models, strong religiousness, measured by church attendance, increases completed fertility of the respondent. For example, as in the preceding section, the fertility differential between strong practicers (Office Frequency = 6) and agents who do not practice at all, is about 16%. Even if this fertility differential is smaller than for the number of children ever born, it is still strictly positive and highly significant even in the case I take into account the effect of the fertility of the parents (of the respondent) as well as the transmission of family values among generations.

### 5.4.2 Entire sample

Finally, as in Brañas-Garza and Neuman (2007), the zero inflated Poisson regression model is also provided for the entire sample including men and women (Table 9). A dummy "Female" is introduced, it has a positive and significant impact on fertility. On the whole population, the variable "Office Frequency" is strongly significant but exhibits a smaller value than for the women's subsample: maximal differential fertility between strong religiousness and no religiousness equals 18,2%.

Obviously, measuring the fertility of men is subject to errors but once again, we can assert that our main results are not due to a bias for sample selection.

# 6 Conclusion

In this paper, I measure the impact of being Catholic on fertility in France. I show that religiosity is the only religious variable which has an impact on the number of children a woman has. Thanks to multivariate analysis, I also detect that a part of the influence of religiosity on fertility comes from the particularized ideology of Catholics. I also validate some conclusions of the rational actor model as for instance the opposite effect of male and female income. These results are in line with a full-fledged literature and are important for instance, for policy makers. Indeed, family policies in France should not elude the fact that there exist fertility differential between substantial parts of the population. Furthermore, the way child allowances are distributed matters as male and female income do not have the same effect on fertility.

Interestingly, my regressions show that religiosity has no impact on childlessness what clearly indicates that the choice to become parent has to be differentiated from the choice about the number of children.

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# Appendix

Table 2: **Zero Inflated Poisson Regression Model**

| **Poisson Part** | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Female Income | -0.056 | -0.052 | -0.052 | -0.050 | -0.051 | -0.051 |
| | (4.28)*** | (3.90)*** | (3.92)*** | (3.81)*** | (3.83)*** | (3.85)*** |
| Male Income | 0.030 | 0.028 | 0.028 | 0.028 | 0.029 | 0.028 |
| | (3.61)*** | (3.35)*** | (3.39)*** | (3.39)*** | (3.46)*** | (3.39)*** |
| Small Town | 0.127 | 0.128 | 0.129 | 0.129 | 0.125 | 0.123 |
| | (3.14)*** | (3.14)*** | (3.17)*** | (3.17)*** | (3.08)*** | (3.03)*** |
| Live In Paris | -0.263 | -0.242 | -0.245 | -0.246 | -0.246 | -0.241 |
| | (4.34)*** | (3.96)*** | (4.00)*** | (4.03)*** | (4.03)*** | (3.95)*** |
| Primary Education | 0.214 | 0.201 | 0.203 | 0.200 | 0.202 | 0.200 |
| | (3.50)*** | (3.28)*** | (3.32)*** | (3.25)*** | (3.29)*** | (3.27)*** |
| Higher Education | -0.073 | -0.06 | -0.061 | -0.062 | -0.068 | -0.067 |
| | (1.55) | (1.27) | (1.28) | (1.30) | (1.43) | (1.41) |
| Never Married | -1.246 | -1.242 | -1.243 | -1.234 | -1.237 | -1.239 |
| | (13.03)*** | (13.00)*** | (13.00)*** | (12.90)*** | (12.92)*** | (12.96)*** |
| More Than 45 | 0.145 | 0.138 | 0.144 | 0.138 | 0.132 | 0.125 |
| | (3.40)*** | (3.24)*** | (3.32)*** | (3.19)*** | (3.05)*** | (2.91)*** |
| Less Than 28 | -0.724 | -0.731 | -0.740 | -0.754 | -0.756 | -0.736 |
| | (3.58)*** | (3.50)*** | (3.49)*** | (3.43)*** | (3.37)*** | (3.42)*** |
| Parental Fertility | | 0.034 | 0.034 | 0.034 | 0.034 | 0.033 |
| | | (2.36)** | (2.37)** | (2.37)** | (2.35)** | (2.33)** |
| Family Values | | 0.079 | 0.080 | 0.077 | 0.075 | 0.075 |
| | | (3.18)*** | (3.22)*** | (3.09)*** | (3.04)*** | (3.02)*** |
| Religious Family of Origin | | | -0.047 | -0.079 | -0.090 | |
| | | | (0.79) | (1.27) | (1.43) | |
| Believer | | | | 0.070 | 0.025 | |
| | | | | (1.72)* | (0.53) | |
| Office Frequency | | | | | 0.032 | 0.032 |
| | | | | | (1.98)** | (2.72)*** |
| Constant | 0.501 | 0.312 | 0.299 | 0.256 | 0.197 | 0.234 |
| | (6.91)*** | (3.26)*** | (3.08)*** | (2.56)** | (1.88)* | (2.30)** |

Results for the Logit part of the regression appears on next page

Table2: Logit part of the Zero Inflated Poisson Regression Model

| **Logit** | | | | | | |
|---|---|---|---|---|---|---|
| Age | -0.593 | -0.630 | -0.642 | -0.664 | -0.680 | -0.648 |
| | (5.43)*** | (5.38)*** | (5.36)*** | (5.35)*** | (5.33)*** | (5.37)*** |
| Higher Education | 1.509 | 1.543 | 1.546 | 1.538 | 1.571 | 1.567 |
| | (2.09)** | (2.09)** | (2.09)** | (2.07)** | (2.09)** | (2.11)** |
| Small Town | -1.349 | -1.383 | 1.383 | -1.39 | -1.38 | -1.38 |
| | (2.24)** | (2.27)** | (2.26)** | (2.27)** | (2.09)** | (2.26)** |
| Constant | 13.684 | 14.454 | 14.695 | 15.145 | 15.494 | 14.820 |
| | (3.34)*** | (2.83)*** | (2.66)*** | (2.34)** | (2.21)** | (2.59)*** |
| Pseudo $R^2$ | 0,134 | 0,137 | 0,137 | 0,137 | 0,138 | 0,138 |
| BIC | -8362 | -8363 | -8359 | -8354 | -8351 | -8366 |
| Vuong Statistic | (3.82)*** | (3.80)*** | (3.80)*** | (3.76)*** | (3.74)*** | (3.76)*** |

* significant at 10%; ** significant at 5 %; * significant at 1 %
Absolute value of z stat in parentheses

Table 3: **Tests for alternative hypothesis**

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Female Income | -0.052*** | -0.050*** | -0.050*** |
| Male Income | 0.029*** | 0.028*** | 0.0273*** |
| Small Town | 0.115*** | 0.111*** | 0.119*** |
| Live In Paris | -0.245*** | -0.231*** | -0.238*** |
| Primary Education | 0.193*** | 0.186*** | 0.190*** |
| Never Married | -1.249*** | -1.250*** | -1.244*** |
| More Than 45 | 0.121*** | 0.122*** | 0.114*** |
| Less Than 28 | -0.482*** | -0.486*** | -0.476*** |
| Office Frequency | 0.0345*** | 0.0339*** | 0.0316** |
| Parental Fertility | | 0.0308** | |
| Family Values | | | 0.079*** |
| Constant | 0.419*** | 0.289*** | 0.381*** |

* significant at 10%; ** significant at 5 %; * significant at 1 %, Absolute value of z stat in parentheses, results of the Logistic part ignored

Table 4: **Alternative Assumptions for the Zero Inflation**

| **Poisson Part** | Selected Model | Extended Model | A1 | A2 | A3 |
|---|---|---|---|---|---|
| Female Income | -0.051*** | -0.050*** | -0.050*** | -0.050*** | -0.050*** |
| Male Income | 0.028*** | 0.027*** | 0.027*** | 0.027*** | 0.027*** |
| Small Town | 0.123*** | 0.110*** | 0.110*** | 0.110*** | 0.109*** |
| Live In Paris | -0.241*** | -0.231*** | -0.231*** | -0.231*** | -0.231*** |
| Primary Education | 0.200*** | 0.201*** | 0.201*** | 0.201*** | 0.201*** |
| Never Married | -1.239*** | -1.235*** | -1.237*** | -1.236*** | -1.237*** |
| More Than 45 | 0.125*** | 0.113*** | 0.113*** | 0.113*** | 0.113*** |
| Less Than 28 | -0.736*** | -0.564*** | -0.565*** | -0.567*** | -0.558*** |
| Parental Fertility | 0.033** | 0.032** | 0.032** | 0.032** | 0.032** |
| Family Values | 0.075*** | 0.076*** | 0.076*** | 0.076*** | 0.075*** |
| Office Frequency | 0.032*** | 0.032*** | 0.032*** | 0.031*** | 0.031*** |
| Constant | 0.234** | 0.257** | 0.257** | 0.258** | 0.260** |
| **Logit** | | | | | |
| Age | -0.648 | -0.518 | -0.521 | -0.519 | -0.518 |
| | (5.42)** | (5.47)*** | (5.76)*** | (5.40)*** | (5.39)*** |
| Office Frequency | | -0.07 | -0.08 | | |
| | | (0.22) | (0.28) | | |
| Small Town | | -1.651 | -1.637 | -1.631 | -1.686 |
| | | (2.48)** | (2.56)** | (2.47)** | (2.52)** |
| Primary Education | | -2.92 | | | |
| | | (0.00) | | | |
| Higher Education | 1.567 | 1.57 | 1.541 | 1.612 | 1.557 |
| | (2.11)** | (2.09)** | (2.09)** | (2.11)** | (2.12)** |
| Small Town | -1.38 | -1.38 | -1.38 | -1.342 | -1.414 |
| | (2.26)** | (2.19)** | (2.26)** | (2.15)** | (2.29)** |
| Family Values | | -0,123 | | | |
| | | (0.33) | | | (0.37) |
| Never Married | | -0.24 | | -0.26 | |
| | | (0.29) | | (0.31) | |
| Constant | 14.820*** | 13.060*** | 13.134*** | 13.122*** | 13.093*** |
| BIC | -8366 | -8339 | -8354 | -8354 | -8355 |

Observations 1793, * significant at 10%; ** significant at 5 %; * significant at 1 %
Absolute value of z statistics in parentheses, z values have been omitted for the Poisson part

Table 5: **Ordered Probit Regression Model and OLS**

| | OProbit 1 | OProbit 2 | OProbit 3 | OLS 1 | OLS 2 | OLS 3 |
|---|---|---|---|---|---|---|
| Female Income | -0.089 | -0.080 | -0.080 | -0.095 | -0.085 | -0.084 |
| | (4.88)*** | (4.38)*** | (4.37)*** | (5.14)*** | (4.61)*** | (4.60)*** |
| Male Income | 0.053 | 0.049 | 0.051 | 0.052 | 0.048 | 0.049 |
| | (4.55)*** | (4.25)*** | (4.35)*** | (4.42)*** | (4.14)*** | (4.22)*** |
| Small Town | 0.251 | 0.248 | 0.250 | 0.243 | 0.234 | 0.236 |
| | (4.38)*** | (4.32)*** | (4.35)*** | (4.09)*** | (3.97)*** | (3.99)*** |
| Live In Paris | -0.374 | -0.344 | -0.350 | -0.327 | -0.299 | -0.305 |
| | (4.93)*** | (4.51)*** | (4.59)*** | (4.35)*** | (3.99)*** | (4.06)*** |
| Primary Education | 0.340 | 0.318 | 0.321 | 0.514 | 0.487 | 0.489 |
| | (3.47)*** | (3.24)*** | (3.27)*** | (4.90)*** | (4.68)*** | (4.70)*** |
| Never Married | -1.357 | -1.363 | -1.360 | -1.053 | -1.052 | -1.048 |
| | (16.00)*** | (16.04)*** | (15.95)*** | (14.12)*** | (14.22)*** | (14.09)*** |
| More Than 45 | 0.227 | 0.197 | 0.206 | 0.274 | 0.232 | 0.239 |
| | (3.92)*** | (3.36)*** | (3.49)*** | (4.54)*** | (3.83)*** | (3.92)*** |
| Less Than 28 | -1.422 | -1.400 | -1.410 | -0.981 | -0.949 | -0.957 |
| | (12.25)*** | (12.04)*** | (12.10)*** | (10.17)*** | (9.90)*** | (9.96)*** |
| Parental Fertility | | 0.060 | 0.060 | | 0.059 | 0.058 |
| | | (3.02)*** | (3.01)*** | | (2.87)*** | (2.85)*** |
| Family Values | | 0.143 | 0.145 | | 0.132 | 0.134 |
| | | (4.10)*** | (4.14)*** | | (3.73)*** | (3.78)*** |
| Office Frequency | | 0.039 | 0.040 | | 0.060 | 0.062 |
| | | (2.00)** | (1.70)* | | (3.00)*** | (2.59)*** |
| No Religion | | | 0.143 | | | 0.122 |
| | | | (1.59) | | | (1.49) |
| Believer | | | 0.042 | | | 0.032 |
| | | | (0.66) | | | (0.48) |
| Constant | | | | 1.604 | 1.138 | 1.089 |
| | | | | (15.89)*** | (8.11)*** | (7.56)*** |
| Pseudo R2 | 0.144 | 0.149 | 0.15 | 0.295 | 0.31 | 0.312 |
| (Adj R for OLS) | | | | | | |
| BIC | -8482 | -8492 | -8480 | | | |

Observations 1793
Absolute value of z statistics in parentheses (t statistics for OLS)
* significant at 10%; ** significant at 5 %; * significant at 1 %

Table 6: **Instrumental Variables for Female Income**

| | qb1 | Female Income Regression |
|---|---|---|
| Female Income | -0.47 | |
| | (3.04)*** | |
| Male Income | 0.141 | 0.207 |
| | (3.81)*** | (14.07)*** |
| Less Than 28 | -1.353 | -0.961 |
| | (7.31)*** | (7.93)*** |
| More Than 45 | 0.319 | 0.334 |
| | (3.66)*** | (4.16)*** |
| Small Town | 0.145 | -0.199 |
| | (2.01)** | (2.59)** |
| Live In Paris | -0.125 | 0.455 |
| | (1.19) | (4.70)*** |
| Primary Education | 0.213 | -0.445 |
| | (1.74)* | (3.19)*** |
| Never Married | -0.954 | 0.241 |
| | (10.71)*** | (2.51)** |
| Parental Fertility | 0.032 | -0.025 |
| | (1.78)* | (0.96) |
| Family Values | 0.087 | -0.123 |
| | (1.98)** | (2.68)*** |
| Office Frequency | 0.166 | -0.036 |
| | (2.37)** | (0.44) |
| Financial Expert | | -0.133 |
| | | (2.69)*** |
| Bank Loan | | -0.550 |
| | | (4.57)*** |
| Constant | 1.85 | 2.350 |
| | (7.24)*** | (9.42)*** |
| Sargan Statistic (all instruments) | 7.68 | |
| C-Statistic for qf18 | 7.68 | |
| Adj R | 0.1404 | 0.303 |
| Difference in Sargan | (7.49)*** | |
| Sargan Statistic | (7.49)*** | |
| Durbin - Hausman - Wu test | -0.48 | |
| (coefficient for residuals) | (3.42)*** | |

Table 7: **Alternative Measure of Religiousness**

| | ZIP 1 | ZIP 2 | ZIP 3 | Oprobit 1 | Oprobit 2 | Oprobit 3 |
|---|---|---|---|---|---|---|
| Female Income | -0.050 | -0.050 | -0.055 | -0.080 | -0.080 | -0.087 |
| | (3.79)[a] | (3.79)[a] | (4.17)[a] | (4.35)[a] | (4.34)[a] | (4.79)[a] |
| Male Income | 0.030 | 0.029 | 0.030 | 0.052 | 0.051 | 0.052 |
| | (3.53)[a] | (3.45)[a] | (3.62)[a] | (4.43)[a] | (4.31)[a] | (4.51)[a] |
| Less Than 28 | -0.750 | -0.734 | -0.729 | -1.410 | -1.401 | -1.419 |
| | (3.45)[a] | (3.48)[a] | (3.57)[a] | (12.07)[a] | (12.02)[a] | (12.21)[a] |
| More Than 45 | 0.133 | 0.126 | 0.148 | 0.207 | 0.196 | 0.230 |
| | (3.06)[a] | (2.91)[a] | (3.45)[a] | (3.48)[a] | (3.32)[a] | (3.95)[a] |
| Small Town | 0.134 | 0.132 | 0.131 | 0.258 | 0.256 | 0.253 |
| | (3.27)[a] | (3.23)[a] | (3.21)[a] | (4.47)[a] | (4.43)[a] | (4.38)[a] |
| Live In Paris | -0.244 | -0.239 | -0.260 | -0.349 | -0.342 | -0.371 |
| | (3.98)[a] | (3.91)[a] | (4.27)[a] | (4.56)[a] | (4.47)[a] | (4.88)[a] |
| Primary Education | 0.174 | 0.171 | 0.192 | 0.288 | 0.285 | 0.317 |
| | (2.78)[a] | (2.75)[a] | (3.09)[a] | (2.91)[a] | (2.87)[a] | (3.21)[a] |
| Never Married | -1.251 | -1.252 | -1.261 | -1.372 | -1.371 | -1.369 |
| | (12.92)[a] | (12.95)[a] | (13.04)[a] | (15.97)[a] | (16.01)[a] | (16.02)[a] |
| Parental Fertility | 0.030 | 0.030 | | 0.057 | 0.057 | |
| | (2.10)[b] | (2.08)[b] | | (2.83)[a] | (2.84)[a] | |
| Family Values | 0.079 | 0.078 | | 0.146 | 0.143 | |
| | (3.14)[a] | (3.11)[a] | | (4.15)[a] | (4.08)[a] | |
| Religious family of origin | -0.087 | | | -0.143 | | |
| | (1.39) | | | (1.75)[c] | | |
| Believer | 0.010 | | | 0.007 | | |
| | (0.20) | | | (0.10) | | |
| Estimated Religiousness | 0.059 | 0.056 | | 0.094 | 0.083 | |
| | (1.94)[c] | (2.29)[b] | | (2.18)[b] | (2.40)[b] | |
| Constant | 0.193 | 0.228 | 0.494 | | | |
| | (1.81)[c] | (2.19)[b] | (6.78)[a] | | | |
| Pseudo R | 0.138 | 0.138 | 0.134 | 0.151 | 0.15 | 0.145 |
| BIC | -8257 | -8270 | -8268 | -8379 | -8391 | -8381 |

Observations 1774, Results for Logit Deleted Absolute value of z statistics in parentheses; [c] significant at 10%; [b] significant at 5%; [a] significant at 1%

Table 8: **Alternative Methods for Age**

| | Age in the Regression | Dummies Strategy |
|---|---|---|
| Female Income | -0.052 | -0.050 |
| | (3.93)*** | (3.81)*** |
| Male Income | 0.035 | 0.029 |
| | (4.14)*** | (3.47)*** |
| Age | 0.008 | |
| | (5.58)*** | |
| Small Town | 0.134 | 0.131 |
| | (3.26)*** | (3.21)*** |
| Live In Paris | -0.239 | -0.240 |
| | (3.90)*** | (3.92)*** |
| Primary Education | 0.106 | 0.174 |
| | (1.64) | (2.79)*** |
| Never Married | -1.239 | -1.255 |
| | (12.70)*** | (12.98)*** |
| Parental Fertility | 0.037 | 0.031 |
| | (2.59)*** | (2.13)** |
| Family Values | 0.080 | 0.077 |
| | (3.20)*** | (3.09)*** |
| Office Frequency | 0.084 | 0.115 |
| | (1.98)** | (2.74)*** |
| More Than 45 | | 0.124 |
| | | (2.87)*** |
| Less Than 28 | | -0.749 |
| | | (3.45)*** |
| Constant | -0.110 | 0.239 |
| | (0.87) | (2.34)** |
| BIC | -8277 | -8272 |

Absolute value of z statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1% Results for Logit Deleted

The impact of age on estimated fertility is positive and significant. However, the impact of religiousness is smaller and is significant only at the 5% confidence level. The impact of female's education is no more significant. This result confirms that directly adding the age variable in the regression captures important effects that are independent from the simple position of the woman in her process of fertility. Indeed, it seems to capture, at least, the recent evolution of school enrollment. Despite this limitation, the effect of religiousness is also validated.

Table 9: **Alternative Samples**

| | Woman Older | Than 45 | Entire Sample | | |
|---|---|---|---|---|---|
| | Oprobit | Poisson | Oprobit | OLS | ZIP |
| Female Income | -0.063 | -0.037 | -0.086 | -0.090 | -0.055 |
| | (2.62)*** | (2.25)** | (5.11)*** | (5.33)*** | (4.42)*** |
| Male Income | 0.024 | 0.010 | 0.057 | 0.055 | 0.032 |
| | (1.60) | (1.03) | (6.86)*** | (6.76)*** | (5.37)*** |
| Small Town | 0.147 | 0.089 | 0.184 | 0.176 | 0.093 |
| | (1.91)* | (1.75)* | (4.44)*** | (4.16)*** | (3.17)*** |
| Live In Paris | -0.280 | -0.175 | -0.350 | -0.298 | -0.227 |
| | (2.80)*** | (2.38)** | (6.07)*** | (5.30)*** | (4.95)*** |
| Primary Education | 0.250 | 0.179 | 0.293 | 0.426 | 0.183 |
| | (2.49)** | (2.86)*** | (4.02)*** | (5.55)*** | (3.97)*** |
| Never Married | -1.928 | -1.758 | -1.423 | -1.072 | -1.334 |
| | (11.95)*** | (8.83)*** | (21.77)*** | (19.36)*** | (17.57)*** |
| Parental Fertility | 0.055 | 0.033 | 0.061 | 0.062 | 0.033 |
| | (2.13)** | (1.88)* | (4.15)*** | (4.16)*** | (3.22)*** |
| Family Values | 0.140 | 0.062 | 0.120 | 0.111 | 0.062 |
| | (3.00)*** | (2.01)** | (4.63)*** | (4.25)*** | (3.40)*** |
| Office Frequency | 0.053 | 0.039 | 0.048 | 0.063 | 0.034 |
| | (2.21)** | (2.45)** | (3.29)*** | (4.19)*** | (3.33)*** |
| Less Than 28 | | | -1.303 | -0.827 | -0.529 |
| | | | (14.51)*** | (11.59)*** | (3.67)*** |
| More Than 45 | | | 0.242 | 0.277 | 0.145 |
| | | | (5.72)*** | (6.40)*** | (4.65)*** |
| Female | | | 0.345 | 0.331 | 0.210 |
| | | | (5.18)*** | (5.00)*** | (4.42)*** |
| Constant | | 0.448 | | 0.763 | 0.016 |
| | | (3.75)*** | | (7.10)*** | (0.20) |
| BIC | -3467 | -3428 | -18125 | | -17833 |
| Observations | 938 | 938 | 3358 | 3358 | 3358 |

* significant at 10%; ** significant at 5%; *** significant at 1%, Results for Logit Deleted
Absolute value of z statistics in parentheses (t statistics for OLS)

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